

Remarks

Receipt is acknowledged of the Office Action mailed 18 May 2005. Claims 1-14 were pending in the application. No claims are amended or canceled. Thus, claims 1-14 are pending for reconsideration at this time.

Applicants note with appreciation the withdrawal of the objections to the specification and the claims.

Rejections Under 35 U.S.C. §103(a)

In the Office Action:

- Claims 1, 4 and 8-14 stand rejected under 35 U.S.C. §103(a) over U.S. Patent No. 6,580,111 ("Kim '111" hereafter) and U.S. Patent Application No. 2002/0020869 ("Park" hereafter) in view of U.S. Patent No. 6,645,882 ("Halliyal" hereafter);
- Claim 2 stands rejected under 35 U.S.C. §103(a) over Kim '111, Park and Halliyal in view of U.S. Patent No. 6,165,841 ("Kim '841" hereafter);
- Claim 3 stands rejected under 35 U.S.C. §103(a) over Kim '111, Park and Halliyal in view of U.S. Publication No. 2003/0232501 ("Kher" hereafter);
- Claims 5 and 6 stand rejected under 35 U.S.C. §103(a) over Kim '111 and Halliyal in view of U.S. Patent No. 6,720,259 ("Londergan" hereafter); and
- Claim 7 stands rejected under 35 U.S.C. §103(a) over Kim '111, Park and Halliyal in view of U.S. Patent No. 6,686,212 ("Conley" hereafter).

Applicants respectfully traverse these rejections for at least the following reasons.

Claims 1-14

Halliyal discloses a method wherein the dielectric film has a stacked structure of HfO_2 - Al_2O_3 film. However, Halliyal discloses fabrication of metal oxide semiconductor field effect transistors (MOSFET) (see column 1, lines 11-22 and column 5, lines 31-37). In contrast, Kim '111 and Park concern capacitors.

Applicants believe that it would not be obvious to a person of ordinary skill in the art to combine Halliyal with Kim '111 and Park. This is because one skilled in the art would not expect that a dielectric for a gate electrode disclosed in Halliyal would be suitable for use as a dielectric material of a capacitor as described in Kim '111. For a gate electrode, the surface characteristics and threshold voltage stability are usually considered when selecting a dielectric. In contrast, leakage current and dielectric constant value are more important factors to be considered in employing the dielectric material for a capacitor.

Please see the attached declaration under 37 C.F.R. §1.132 and refer to figures 1 and 2. As explained in the declaration, figure 1 depicts a plot of gate current density (A/cm^2) against the gate voltage (V) as published in Y. Taur, IEEE (1997 International Electron Devices Meeting IEDM). Figure 2 depicts a plot of gate current (A/cm^2) against the thickness (A°) of a gate oxide and utilizes data obtained from experiments conducted in the applicants' facility. As explained in the declaration, the leakage current of a gate oxide ranges from 1 to 100 A/cm^2 , while the leakage current of a dielectric material of a capacitor is usually less than $1 \times 10^{-7} A/cm^2$. Therefore, the leakage current of a dielectric material of a capacitor substantially differs from that of the dielectric for a gate electrode by 7 to 9 logs. Accordingly, it would not be obvious to one of ordinary skill in the art to replace the dielectric material of a capacitor with the dielectric material of a gate electrode given the 7 to 9 log difference in leakage current. In fact, the vast difference in leakage current would discourage the person of ordinary skill in the art from combining teachings of gate electrode with teachings of capacitors.

Summary

In view of the aforementioned remarks, withdrawal of the rejection of claims 1-14 under 35 U.S.C. §103(a) is respectfully requested.

Conclusion

In view of the above amendments and remarks, Applicants respectfully request that all objections and rejections be withdrawn and that a notice of allowance be forthcoming. The Examiner is invited to contact the undersigned for any reason related to the advancement of this case.

Respectfully submitted,

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